

MARYLAND AVENUE RESURFACING

**City of Clayton
Board of Aldermen
August 14, 2018**

Project History

- **Concepts presented at April 11 public meeting**
- **BOA presentation on May 22**
- **Survey handout presented at June 12 BOA meeting**
- **Design matrix presented at July 10 BOA meeting**

Bike Options – Design Matrix

	BICYCLE FACILITY OPTIONS - MARYLAND AVENUE											
MARYLAND ROAD SECTION	VEHICLE LANES				PARKING SPACES				COST			REMARKS
	EASTBOUND		WESTBOUND		NORTH SIDE		SOUTH SIDE					
	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	EXISTING	PROPOSED	ENGR STUDY	TRAFFIC STUDY	CONSTRUCTION	
Hanley to Meramec												
Buffered Bike Lanes	2	2	2	1	33	33	31	31	Completed	\$3,000	\$6,000-\$8,000	
Protected Bike Lanes	2	2	2	1	33	33	31	31	\$4,000	\$3,000	\$15,000-\$20,000	Parking protected
Meramec to Forsyth												
Buffered Bike Lanes	2	1	2	1	34	34	29	29	\$1,500	\$3,000	\$6,000-\$8,000	
Protected Bike Lanes	2	1	2	1	34	34	29	29	\$4,000	\$3,000	\$20,000-\$25,000	Parking protected
Forsyth to Gay												
Buffered Bike Lanes	2	1	2	2	44	0	0	0	\$4,000	\$4,000	\$6,000-\$8,000	
Protected Bike Lanes	2	1	2	2	44	0	0	0	\$6,000	\$4,000	\$50,000-\$70,000	Protection - Design Line or Other Barrier
Bike Lanes (No Buffer)	2	1	2	2	44	44	0	0	\$3,000	\$3,000	\$6,000-\$8,000	This bike lane option would allow parking to remain along north side of Maryland
Shared Lanes	2	2	2	2	44	44	0	0	Completed	N/A	\$4,000-\$6,000	Option in funding application
Off-Route Bike Facility	2	2	2	2	44	44	0	0	\$4,000	N/A	\$10,000-\$15,000	Signage and traffic calming
Shared Use Side Path on South Side	2	2	2	2	44	44	0	0	\$10,000	N/A	\$100,000-\$150,000	Would require agreement with Caleres, does not include right-of-way costs

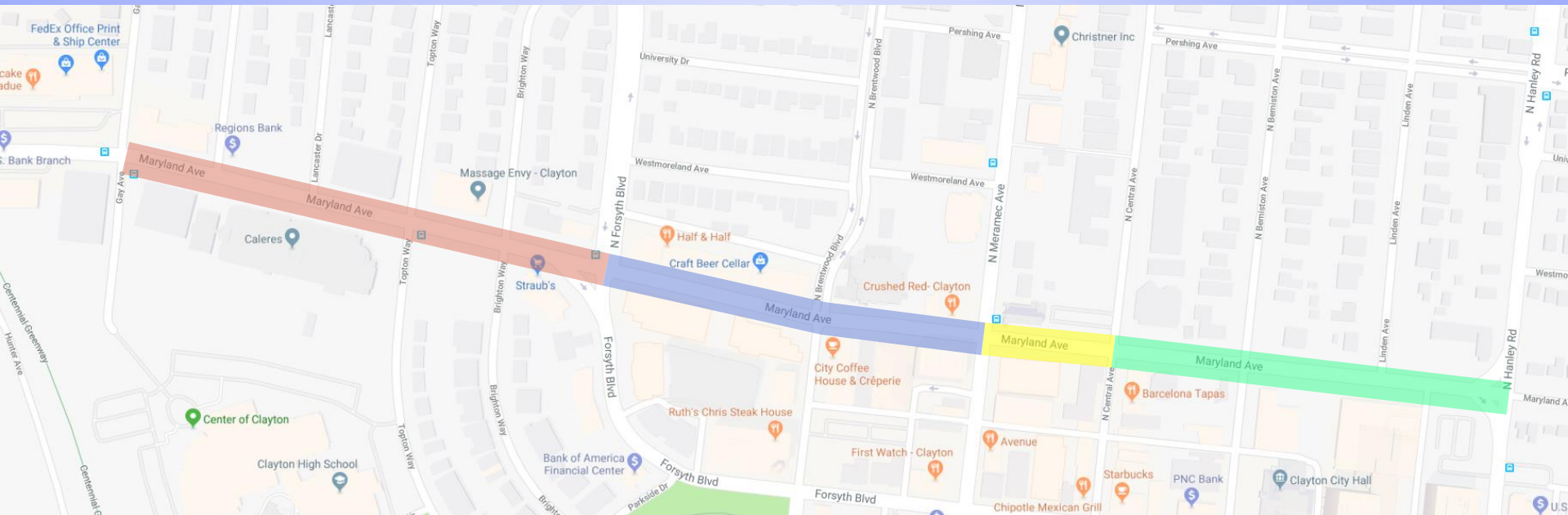
Notes from CBB:
 Traffic Study Costs - All Options Assume Base Cost Of \$7K. IF all Options are Evaluated,
 Total Cost Would Be \$20k.
 Assumes VISSIM model for 1 peak hour to generate travel times.

Bike Options – Design Matrix

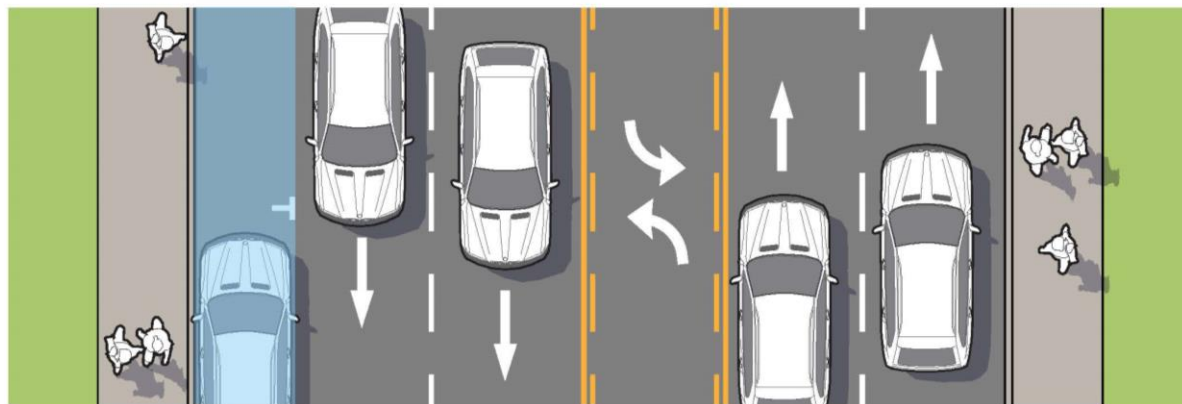
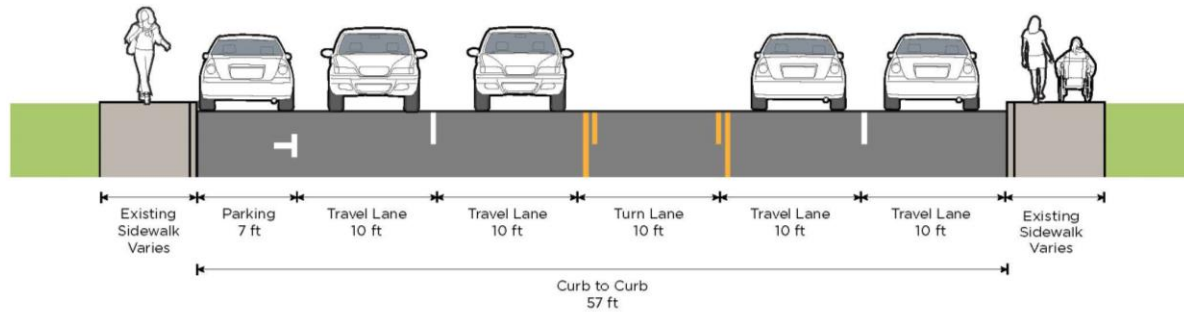
MARYLAND ROAD SECTION
Hanley to Meramec
Buffered Bike Lanes
Protected Bike Lanes
Meramec to Forsyth
Buffered Bike Lanes
Protected Bike Lanes
Forsyth to Gay
Buffered Bike Lanes
Protected Bike Lanes
Bike Lanes (No Buffer)
Shared Lanes
Off-Route Bike Facility
Shared Use Side Path on South Side

Bike Options – By Segments

Gay to Hanley

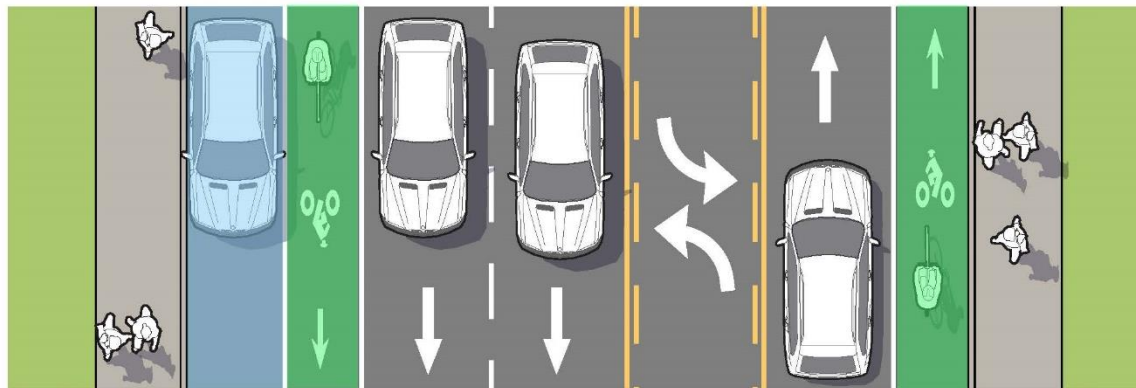
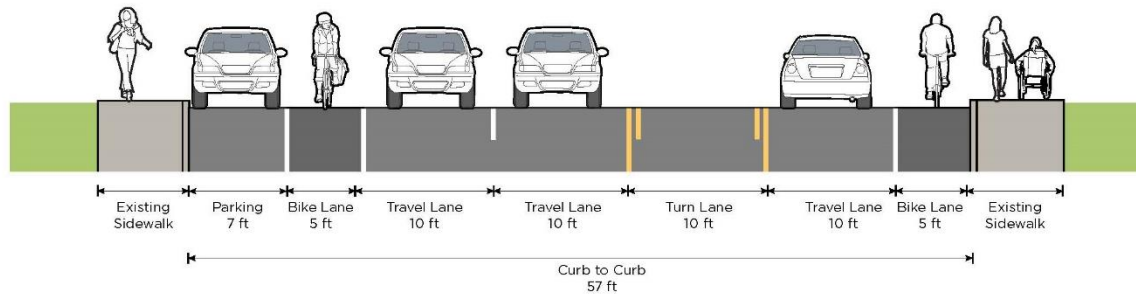


Gay to Forsyth – Existing Section



Looking East

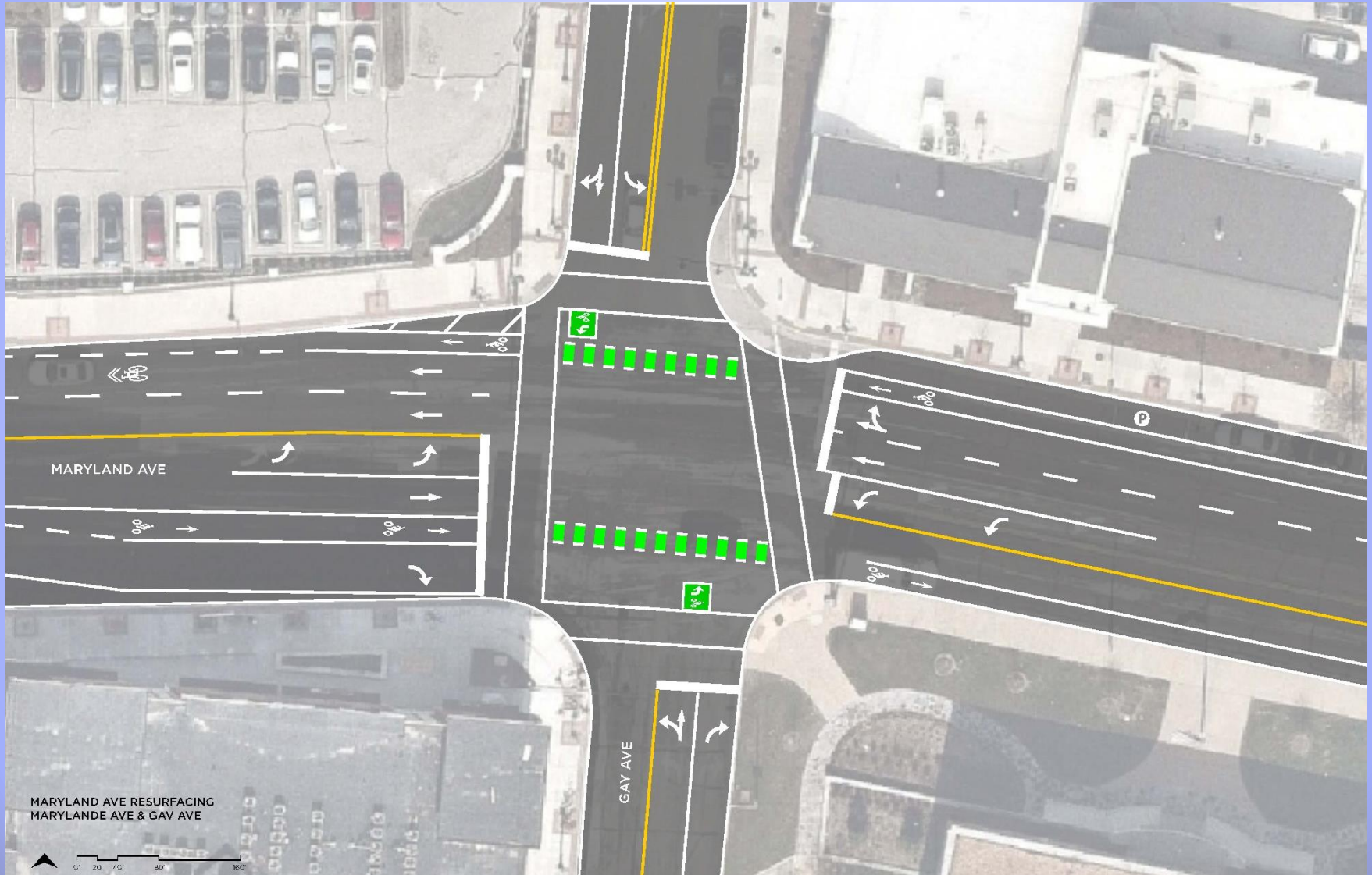
Gay to Forsyth – Bike Lanes (No Buffer)



Looking East

Maryland Avenue – Intersection Concepts

Gay Intersection

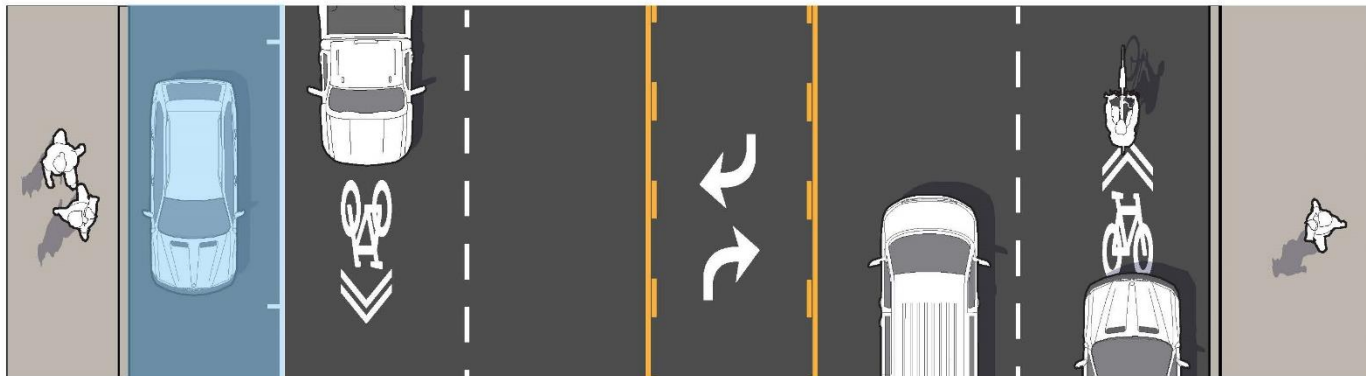
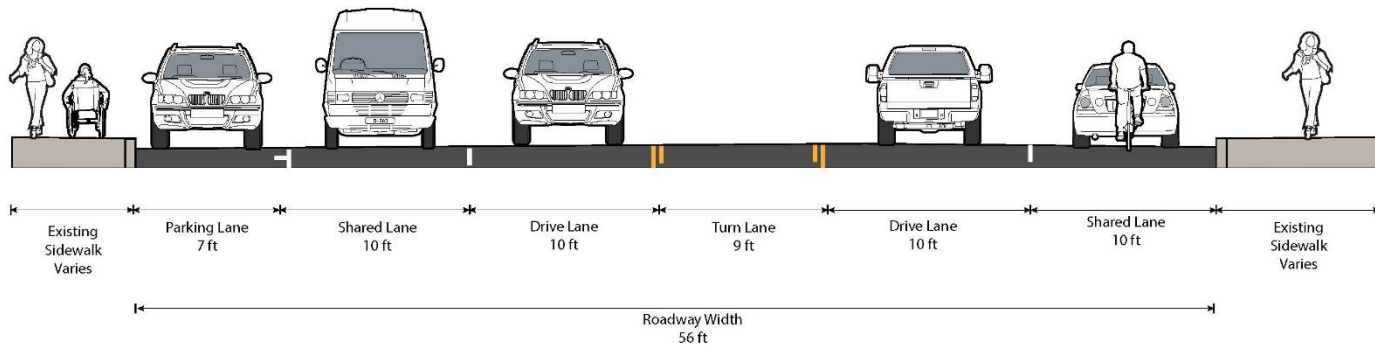


Maryland Avenue – Intersection Concepts

Forsyth Intersection (Bike Lanes to the West)

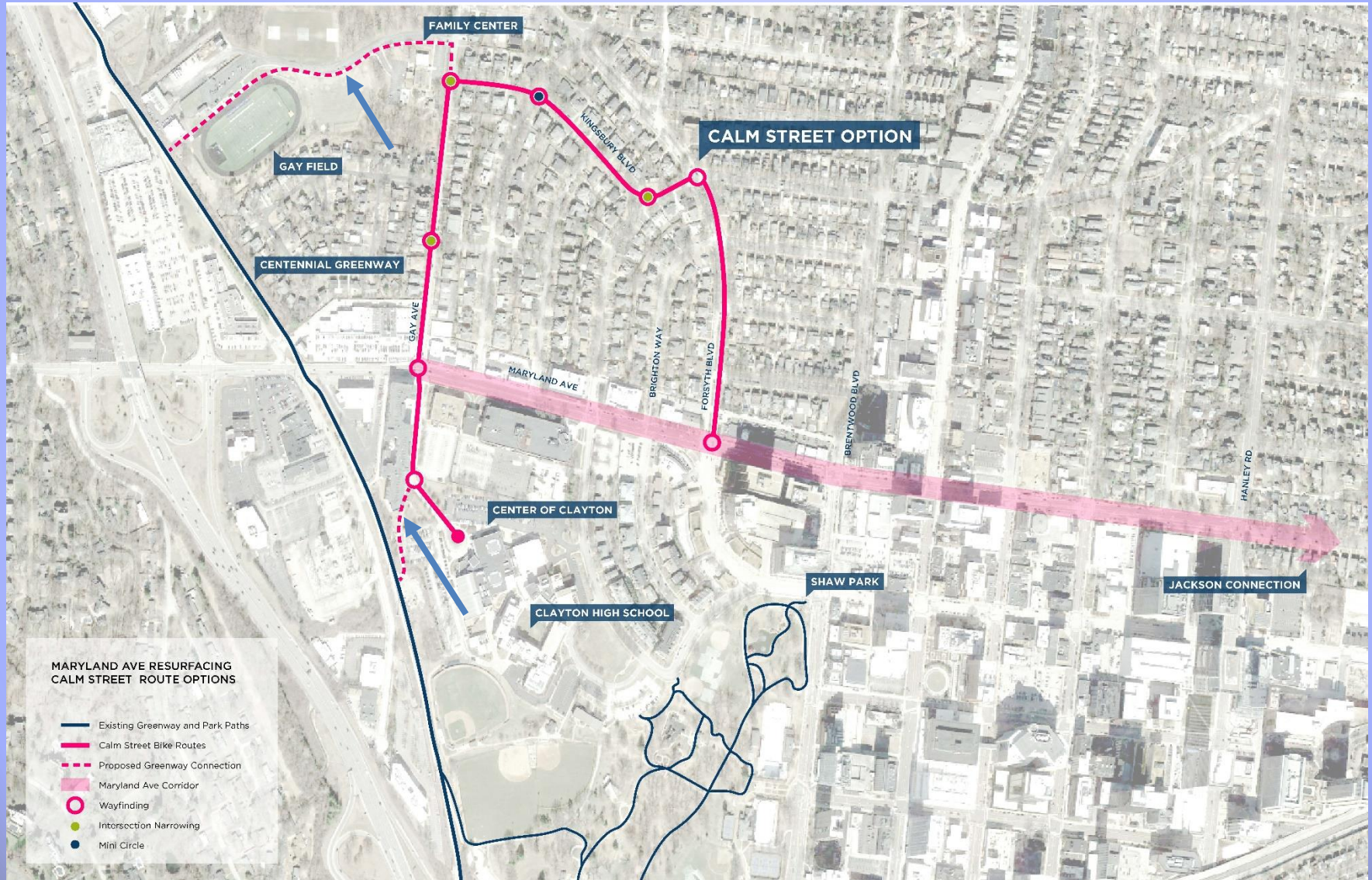


Gay to Forsyth – Shared Lanes



Looking East

Gay to Forsyth – Off Route Bike Facility



Traffic Impacts

2 Lanes
EB & WB

2 Lanes WB &
1 Lane EB

Table 1: Traffic Operating Conditions – Existing and Proposed Option

Intersection/Approach	Existing Conditions		Proposed Option	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
<i>Maryland Avenue and Gay Avenue – Signalized</i>				
Eastbound Maryland Avenue	B (12.3) 465' TH	A (8.8) 175' TH	E (68.7) 1460' TH	B (11.7) 425' TH
Westbound Maryland Avenue	B (14.5) 165' TH	A (9.8) 330' TH	B (12.9) 165' TH	B (12.4) 420' TH
Northbound Gay Avenue	C (30.8) 50' LT	D (53.9) 200' LT	C (30.8) 50' LT	D (53.9) 200' LT
Southbound Gay Avenue	C (25.8) 55' LT	C (29.6) 100' LT	C (25.8) 55' LT	C (29.6) 100' LT
Overall Intersection	B (14.3)	B (14.6)	D (51.2)	B (16.8)
<i>Maryland Avenue and Topton Way – Signalized</i>				
Eastbound Maryland Avenue	A (2.5) <25' TH	A (8.5) 150' TH	D (45.8) 1025' TH	B (13.3) 365' TH
Westbound Maryland Avenue	A (<1.0) <25' TH	A (2.0) 45' TH	A (5.1) 75' LT	A (4.7) 135' TH
Northbound Topton Way	D (36.6) 45' LT	D (48.2) 180' LT	D (36.6) 45' LT	D (48.2) 180' LT
Southbound Topton Way	D (46.0) 50' TH	C (26.1) <25' TH	D (46.0) 50' TH	C (26.1) <25' TH
Overall Intersection	A (3.6)	A (9.0)	C (33.7)	B (12.2)
<i>Maryland Avenue and Forsyth Boulevard – Signalized</i>				
Eastbound Maryland Avenue	A (2.3) 90' TH	A (6.1) 115' TH	A (7.0) 335' TH	A (8.8) 265' TH

Traffic Impacts

Bike Lane – Queue Lengths – Gay Intersection

1200 vehicles/hour



LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts

Bike Lane – Queue Lengths – Tipton Intersection

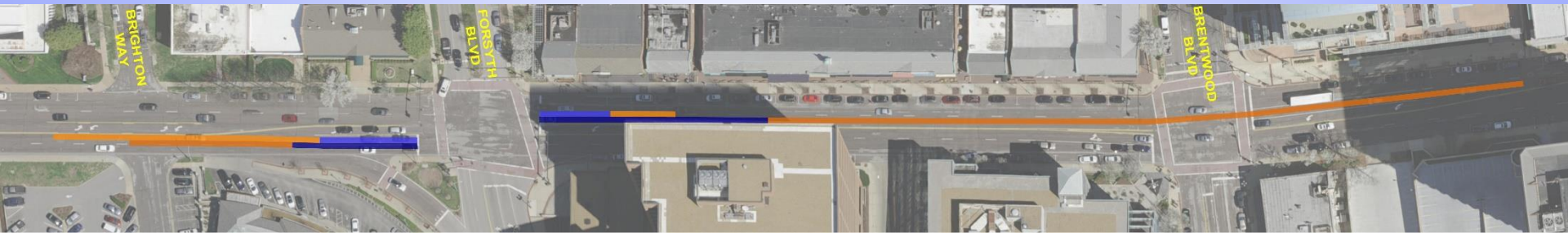


LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts

Bike Lane – Queue Lengths – Forsyth Intersection



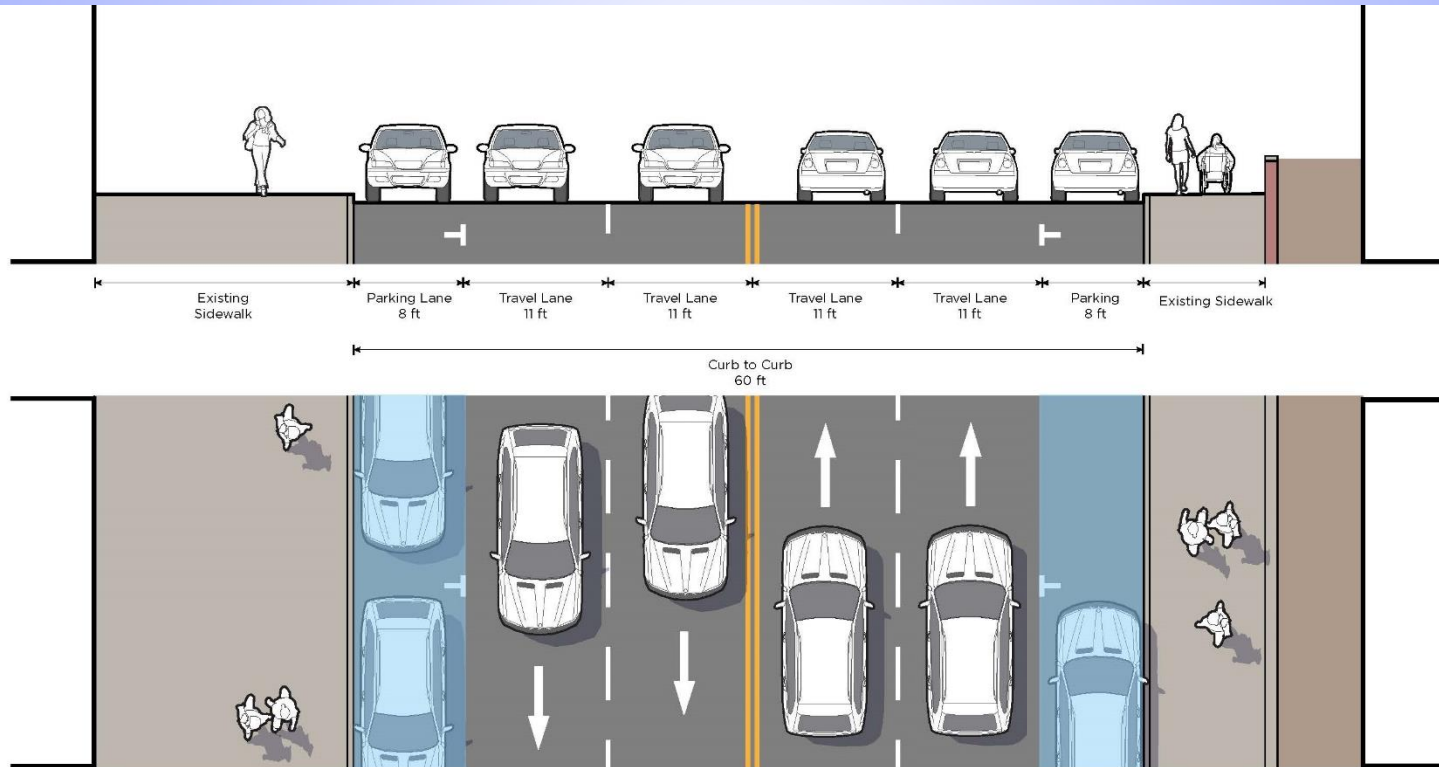
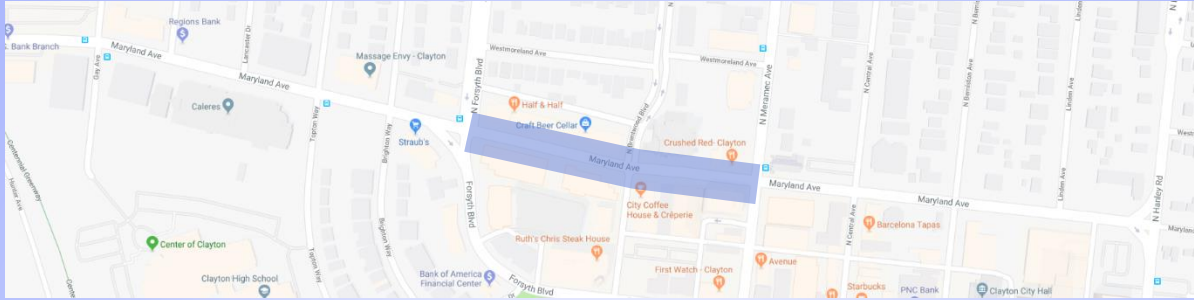
LEGEND

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- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts Analysis

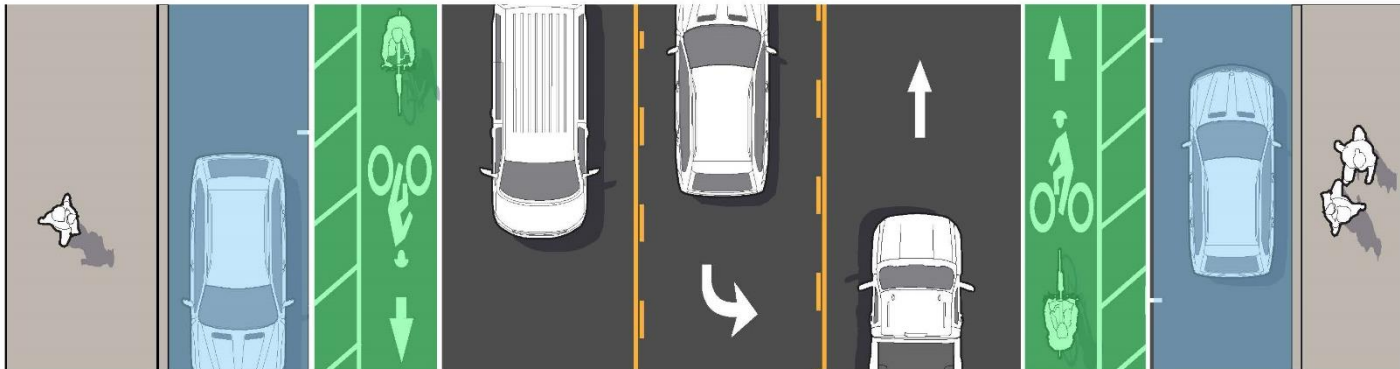
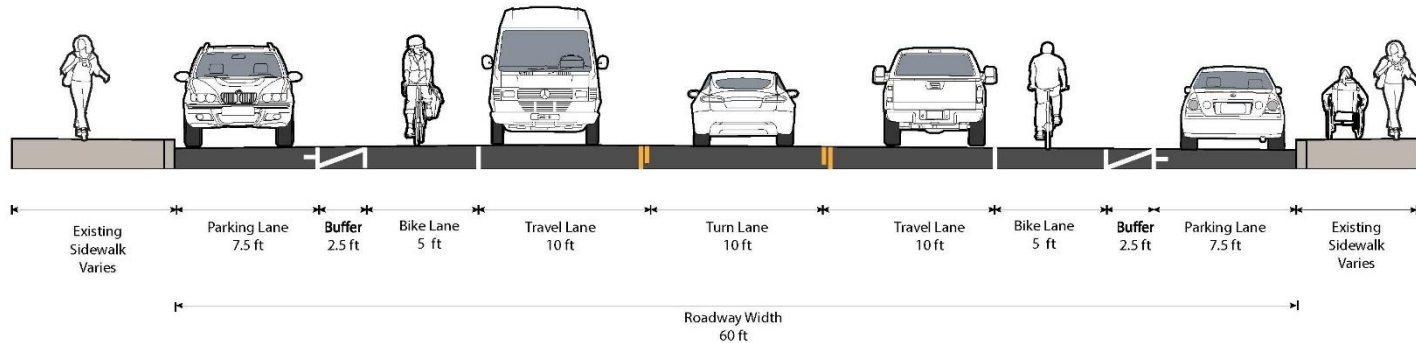
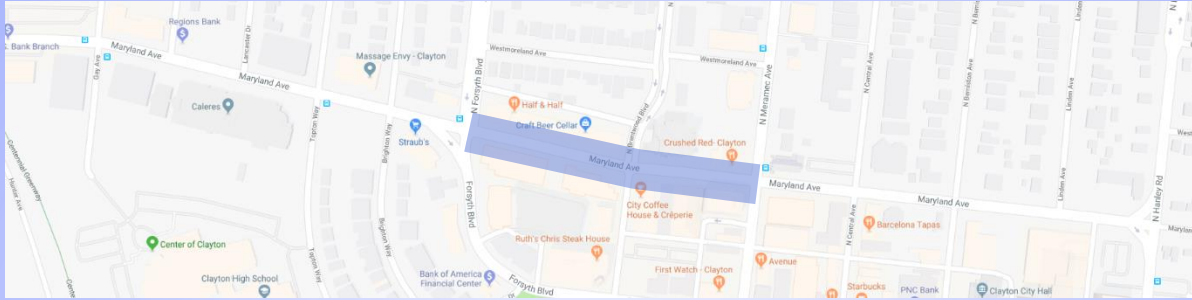
- **Failing operations expected for EB AM**
 - **1200 vehicles per hour**
 - **1500' queue, backup to I-170**
 - **3 signal cycles to clear Gay intersection**
 - **Average delay over 1 minute; however, 4½ to 6 minute delay for 10% of traffic**
 - **1-lane EB configuration not recommended**

Forsyth to Meramec – Existing Section



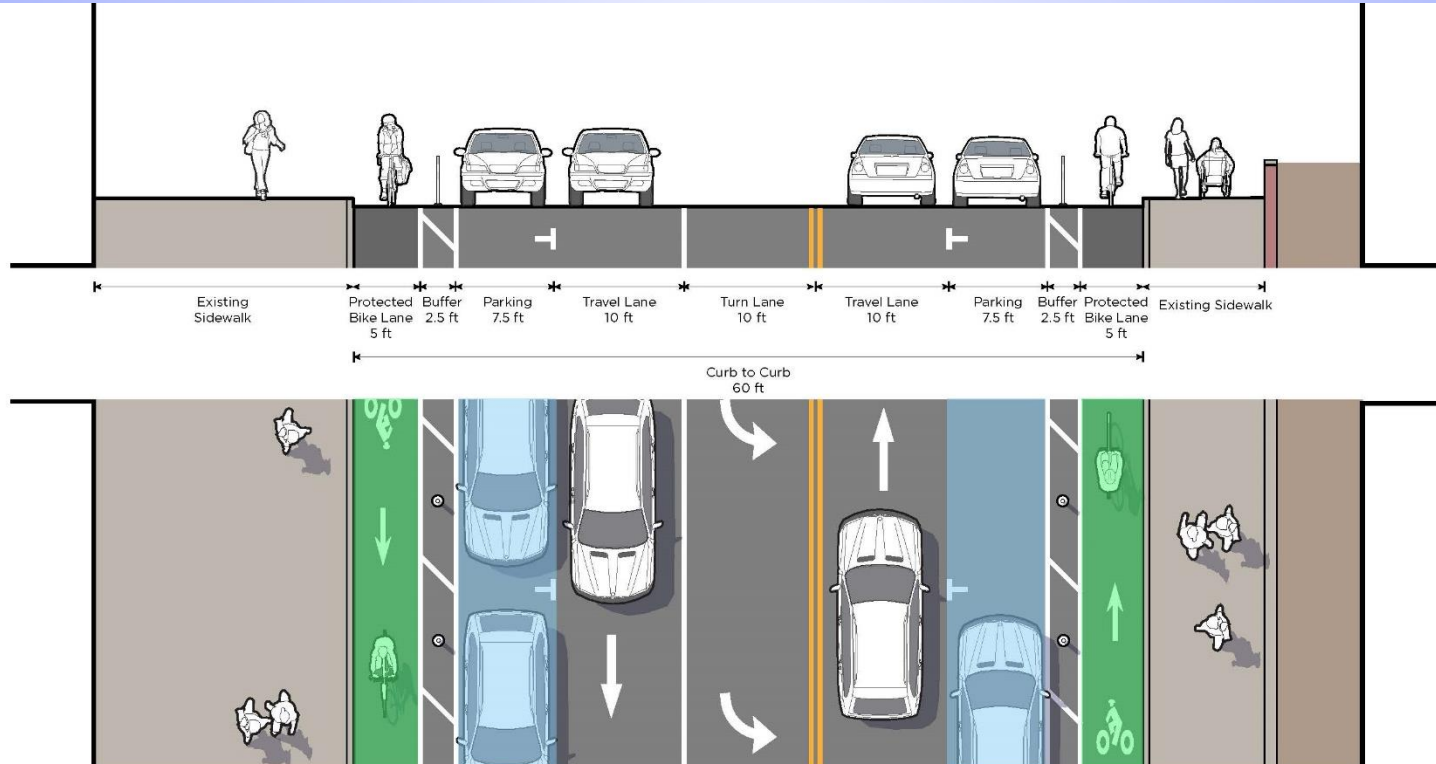
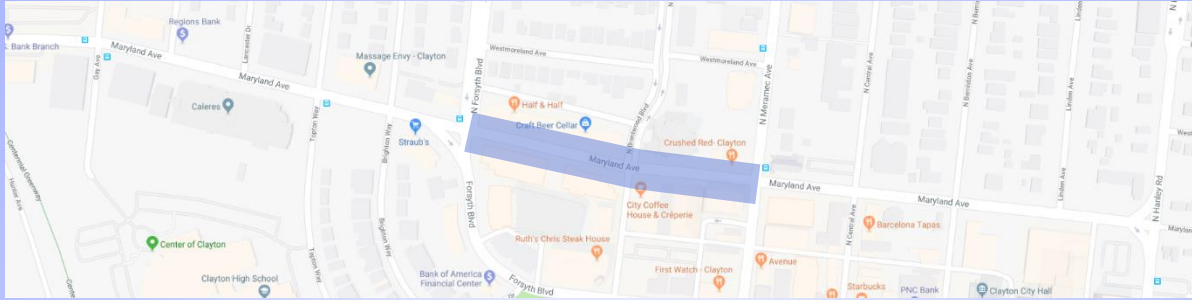
Looking East

Forsyth to Meramec – Buffered Bike Lanes



Looking East

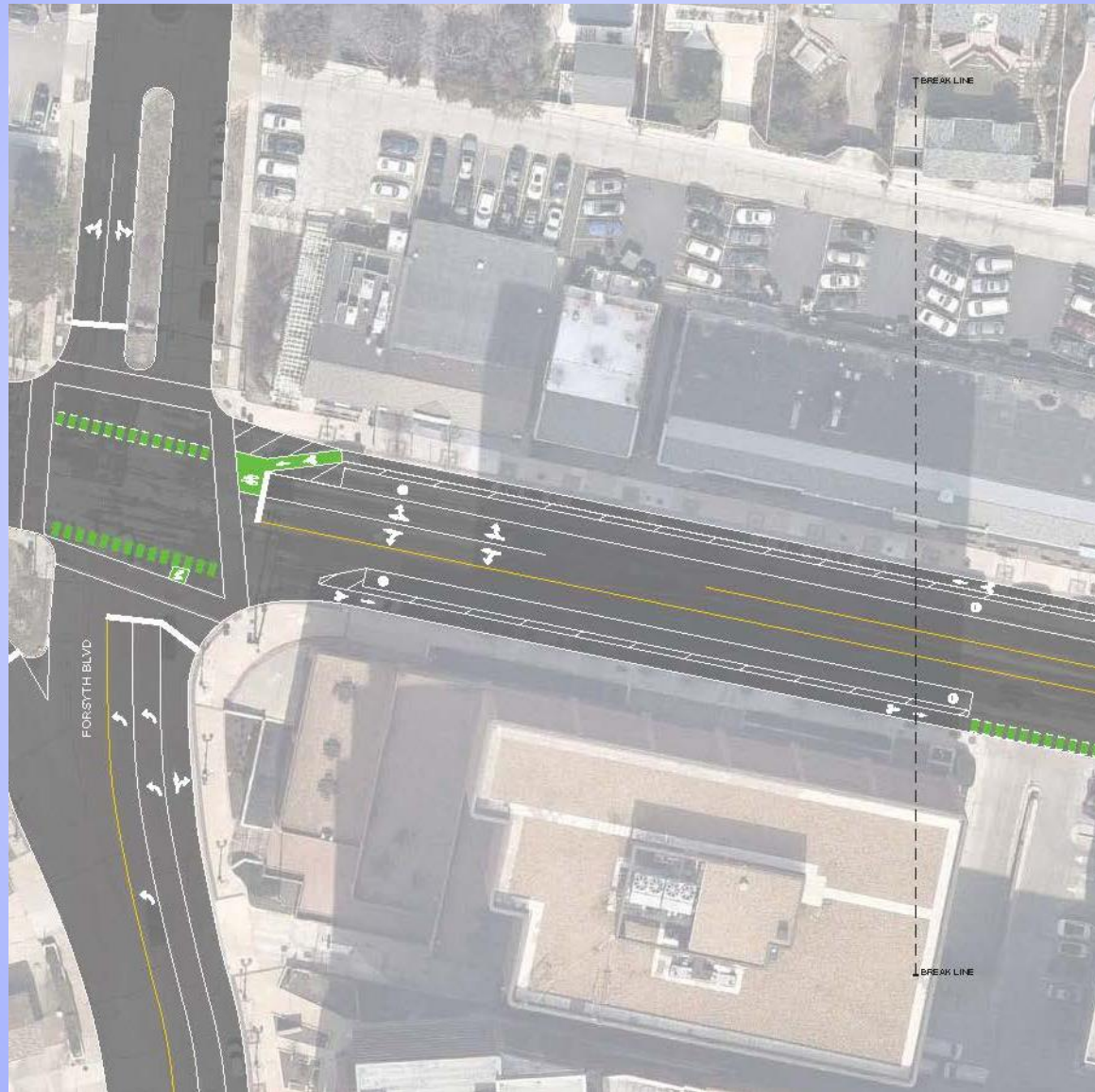
Forsyth to Meramec – Protected Bike Lanes



Looking East

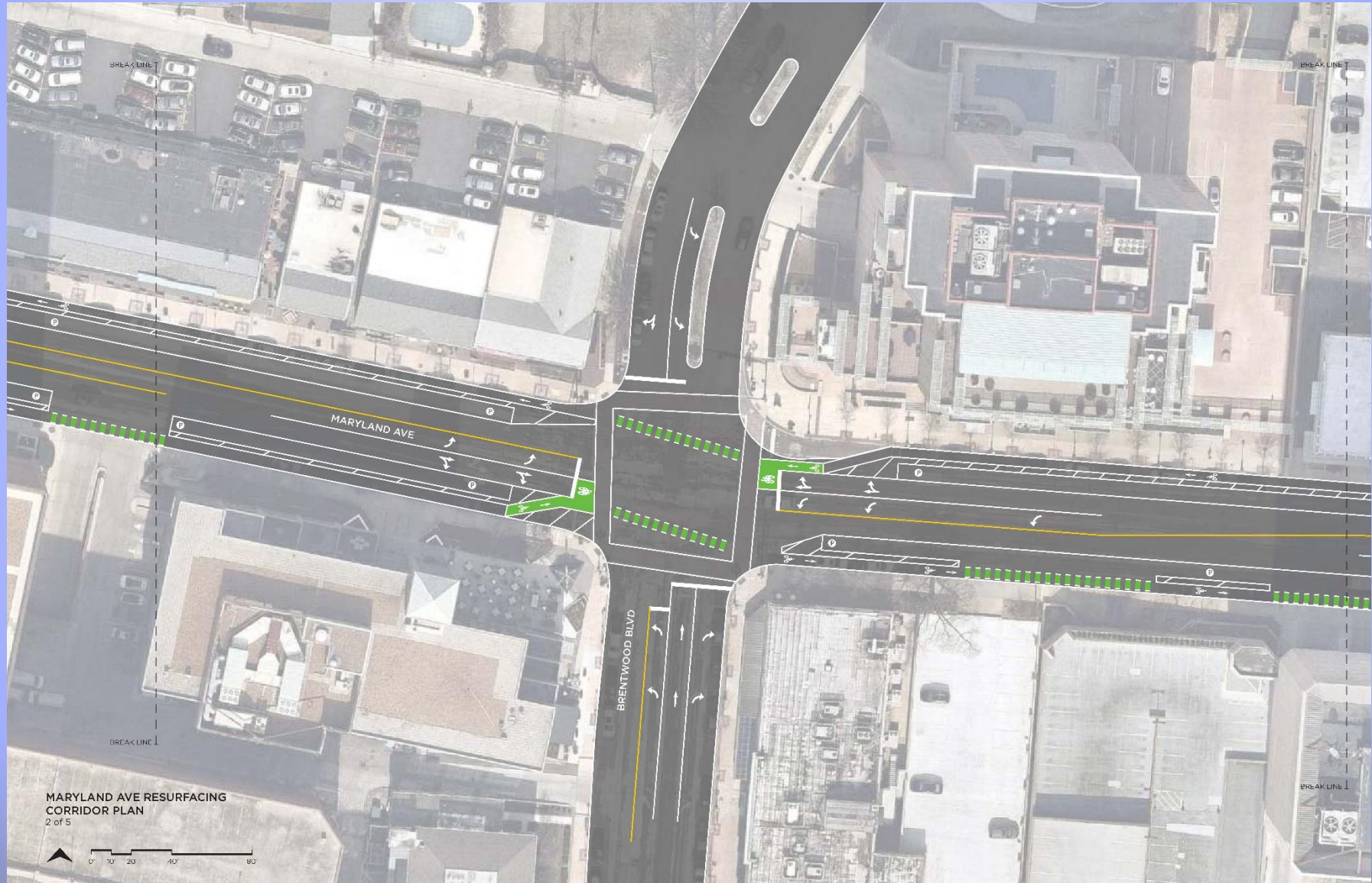
Maryland Avenue – Intersection Concepts

Forsyth Intersection (Protected Bike Lanes to the East)



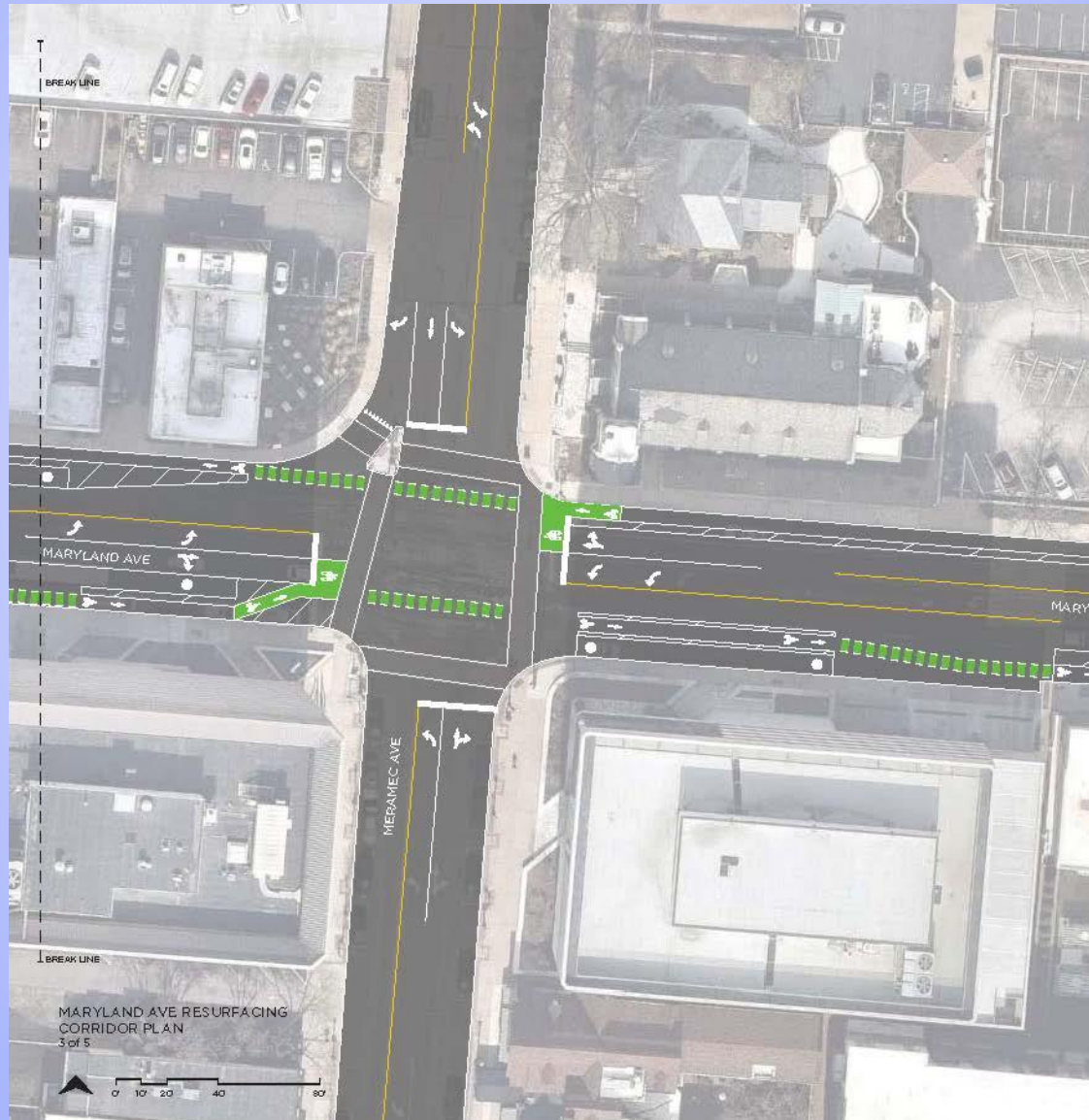
Maryland Avenue – Intersection Concepts

Brentwood Intersection (Protected Bike Lanes)



Maryland Avenue – Intersection Concepts

Meramec Intersection (Protected Bike Lanes)



Traffic Impacts

2 Lanes
EB & WB

1 Lane
EB & WB

Table 1: Traffic Operating Conditions – Existing and Proposed Option

Intersection/Approach	Existing Conditions		Proposed Option	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
<i>Maryland Avenue and Forsyth Boulevard – Signalized</i>				
Eastbound Maryland Avenue	A (2.3) 90' TH	A (6.1) 115' TH	A (7.0) 335' TH	A (8.8) 265' TH
Westbound Maryland Avenue	A (4.4) 65' TH	B (15.3) 210' TH	A (5.3) 125' TH	C (31.4) 905' TH
Northbound Forsyth Boulevard	D (47.4) 65' LT	D (48.9) 220' LT	D (47.4) 65' LT	D (48.9) 220' LT
Southbound Forsyth Boulevard	D (52.6) 150' TH	D (49.8) 95' TH	D (52.6) 150' TH	D (49.8) 95' TH
Overall Intersection	B (14.5)	C (24.4)	B (17.2)	C (31.3)
<i>Maryland Avenue and Brentwood Boulevard – Signalized</i>				
Eastbound Maryland Avenue	A (5.7) 40' TH	B (15.7) 145' TH	A (7.9) 125' TH	B (17.4) 245' TH
Westbound Maryland Avenue	B (17.5) 185' TH	A (3.0) 55' TH	B (18.0) 380' TH	A (7.6) 235' TH
Northbound Brentwood Boulevard	C (24.3) 105' LT	C (27.2) 140' LT	C (24.3) 105' LT	C (27.2) 140' LT
Southbound Brentwood Boulevard	D (51.6) 115' TH	D (38.7) 60' TH	D (51.6) 115' TH	D (38.7) 60' TH
Overall Intersection	B (18.6)	B (12.9)	B (19.5)	B (15.5)
<i>Maryland Avenue and Meramec Avenue – Signalized</i>				
Eastbound Maryland Avenue	C (23.1) 205' TH	A (9.0) 75' TH	C (28.1) 480' TH	B (18.9) 375' TH

Traffic Impacts

Bike Lane – Queue Lengths – Forsyth Intersection



LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts

Bike Lane – Queue Lengths – Brentwood Intersection

600 vehicles/hour

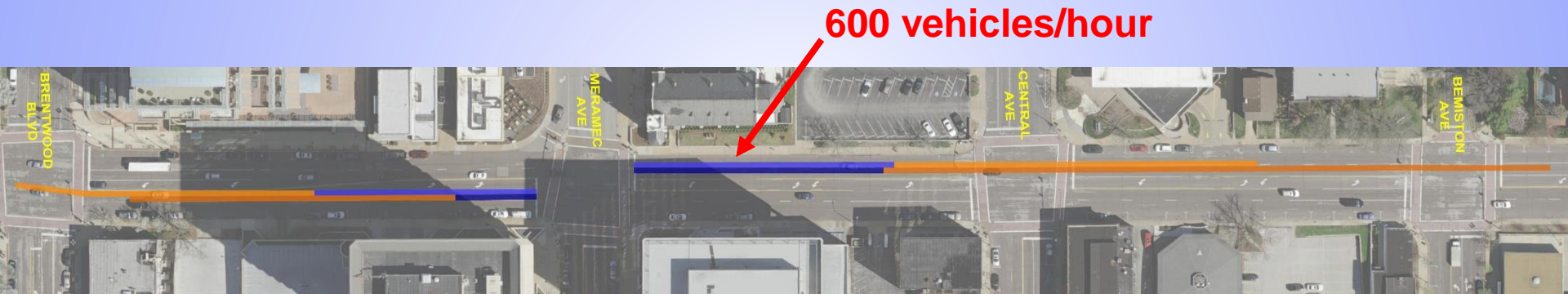


LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts

Bike Lane – Queue Lengths – Meramec Intersection



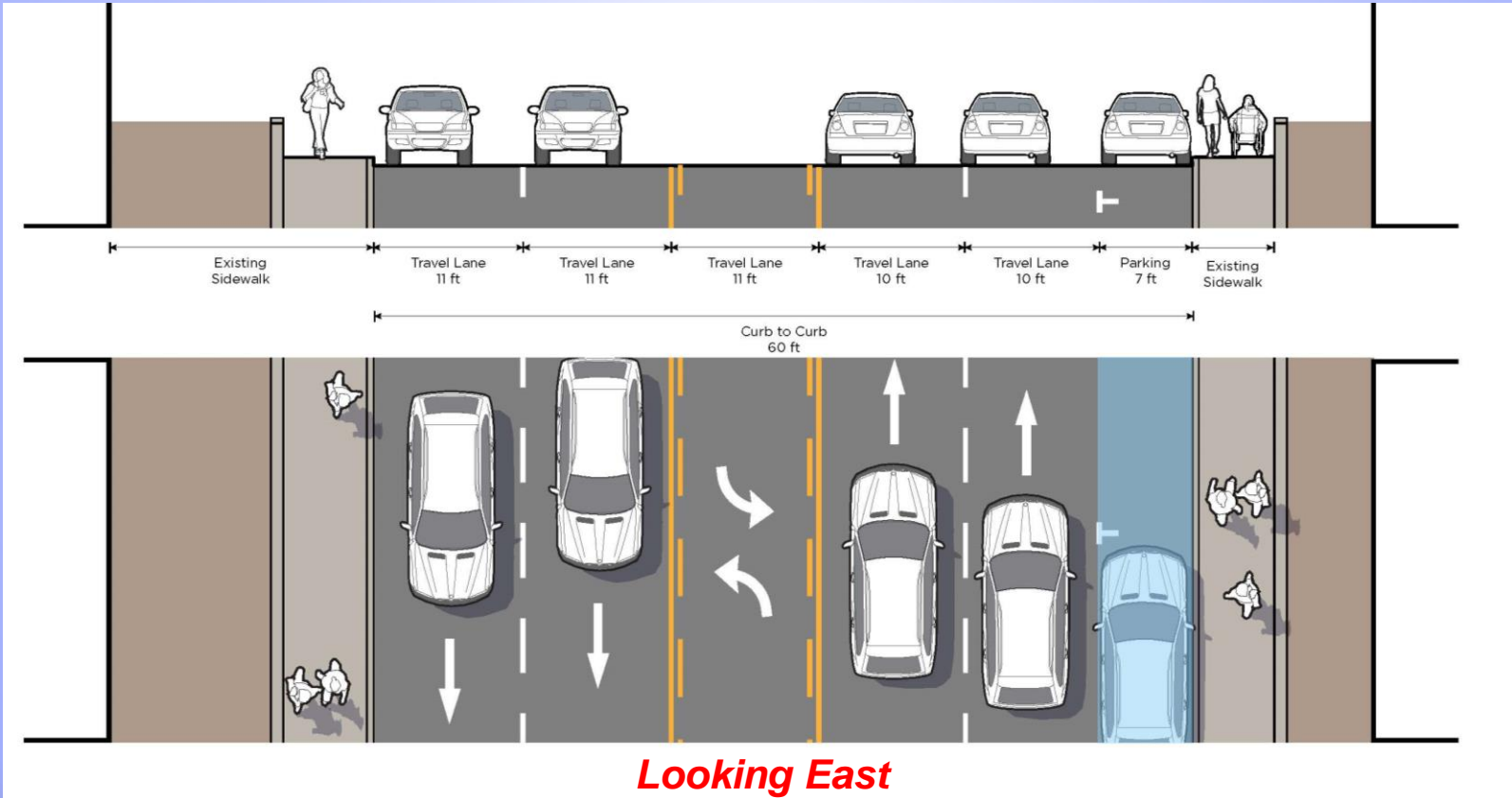
LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

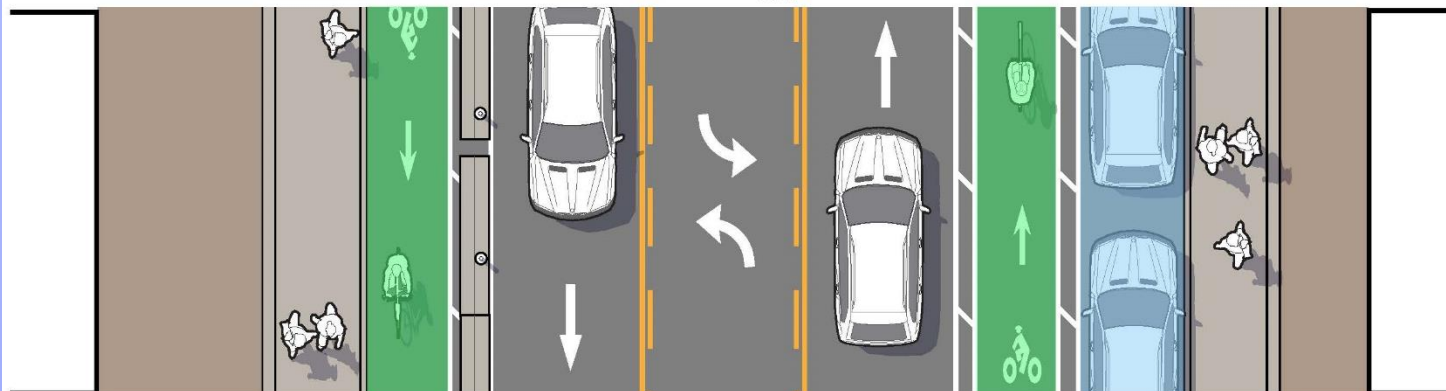
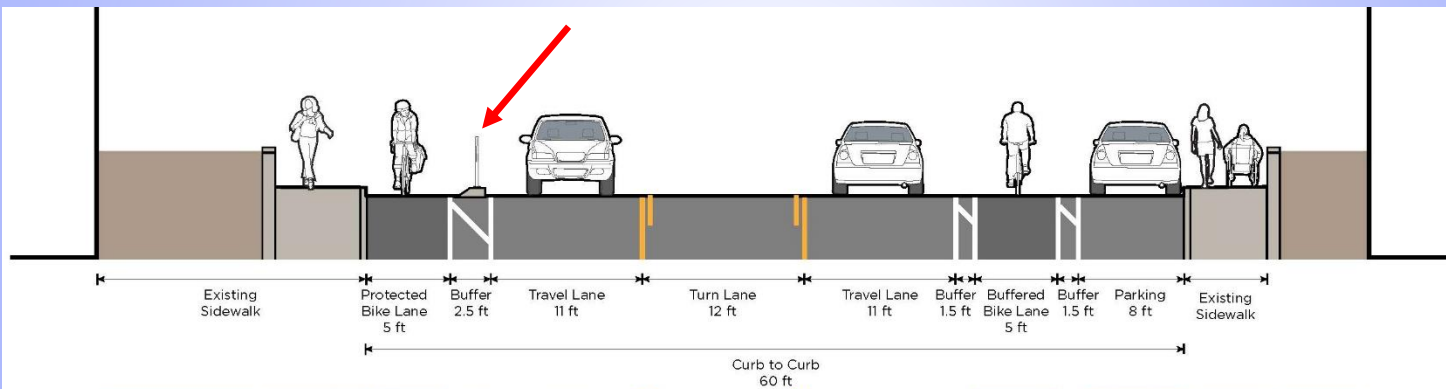
Traffic Impacts Analysis

- **Impacts to WB PM traffic**
 - **600 vehicles per hour**
 - **900' queue**
 - **2 signal cycles to clear Forsyth & Meramec intersections**
 - **Average delay around 1 minute; however, 2 to 3 minute delay for 10% of traffic**
 - **1-lane WB configuration appears feasible**

Meramec to Central – Existing Section



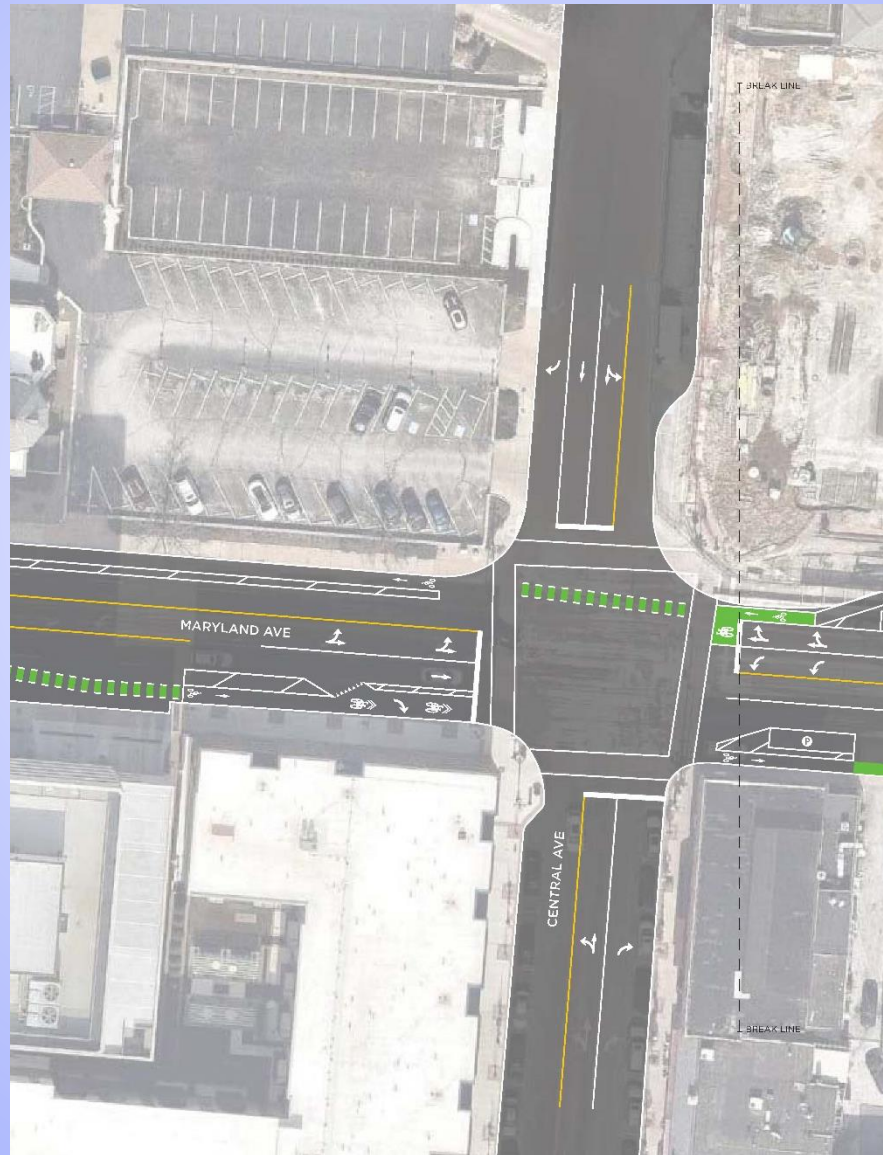
Meramec to Central – Protected or Buffered Bike Lanes



Looking East

Maryland Avenue – Intersection Concepts

Central Intersection



Traffic Impacts

2 Lanes
EB & WB

1 Lane
EB & WB

Table 1: Traffic Operating Conditions – Existing and Proposed Option

Intersection/Approach	Existing Conditions		Proposed Option	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
<i>Maryland Avenue and Meramec Avenue – Signalized</i>				
Eastbound Maryland Avenue	C (23.1) 205' TH	A (9.0) 75' TH	C (28.1) 480' TH	B (18.9) 375' TH
Westbound Maryland Avenue	B (10.6) 240' TH	B (10.2) 230' TH	B (16.9) 575' TH	C (26.8) 845' TH
Northbound Meramec Avenue	C (27.0) 50' TH	D (38.8) 125' TH	C (27.0) 50' TH	D (38.8) 125' TH
Southbound Meramec Avenue	C (24.9) 140' TH	C (20.6) 105' LT	C (24.9) 140' TH	C (20.6) 105' LT
Overall Intersection	B (19.3)	B (14.3)	C (23.5)	C (24.0)
<i>Maryland Avenue and Central Avenue – Signalized</i>				
Eastbound Maryland Avenue	A (4.7) 40' TH	A (4.5) 60' TH	A (5.9) 90' TH	A (6.5) 120' TH
Westbound Maryland Avenue	B (13.0) 190' TH	B (14.0) 175' TH	B (17.8) 400' TH	C (21.4) 500' TH
Northbound Central Avenue	C (26.5) 75' TH	C (27.5) 125' TH	C (26.5) 75' TH	C (27.5) 125' TH
Southbound Central Avenue	B (18.4) 35' RT	B (19.9) 30' RT	B (18.4) 35' RT	B (19.9) 30' RT
Overall Intersection	B (11.3)	B (12.2)	B (13.9)	B (16.0)

Traffic Impacts

Bike Lane – Queue Lengths – Central Intersection



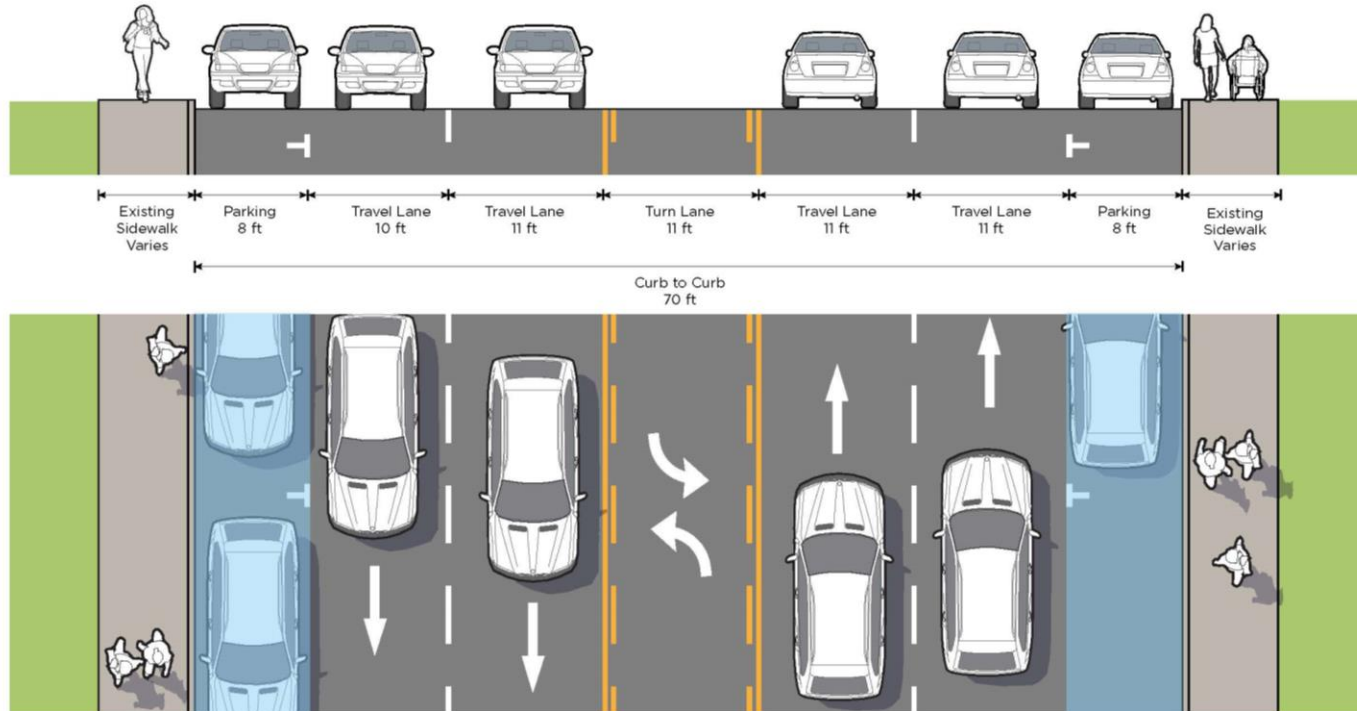
LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts Analysis

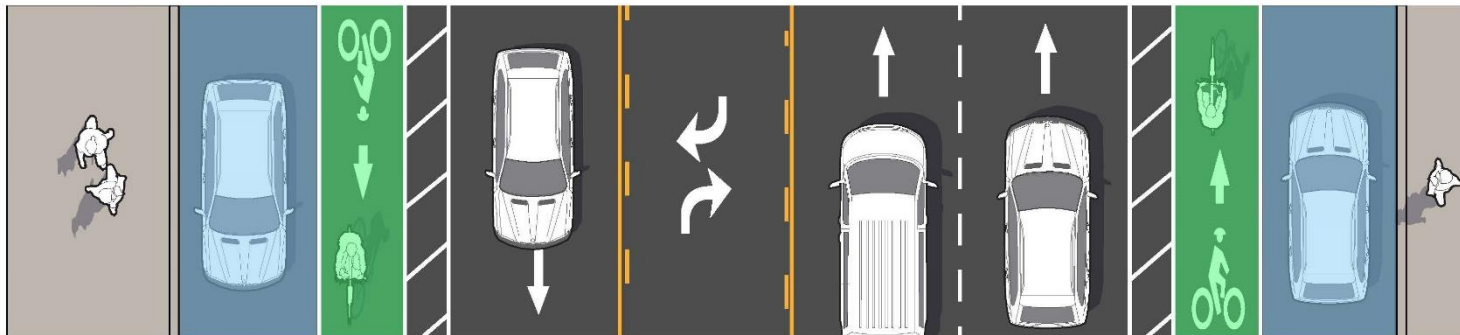
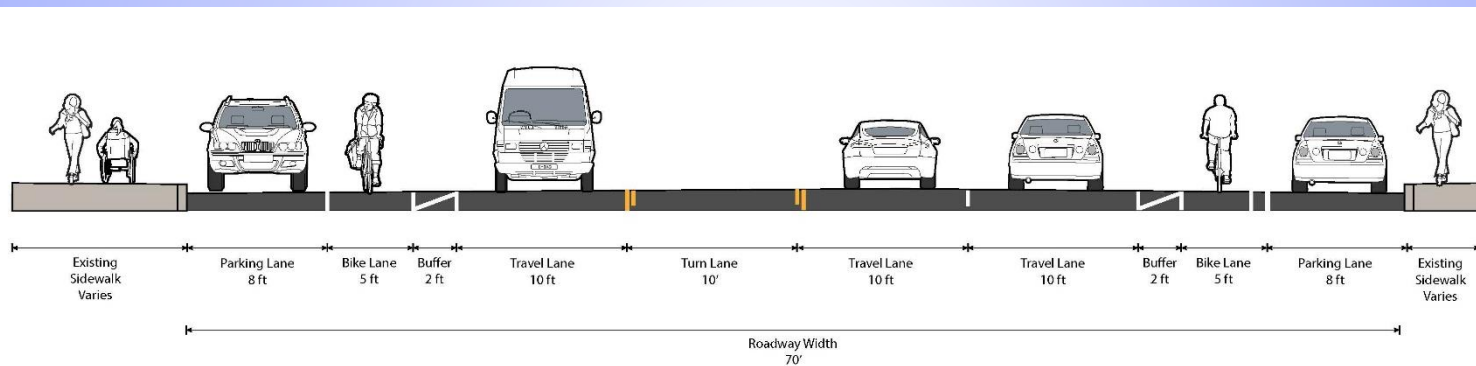
- **Impacts to WB PM traffic**
 - **600 vehicles per hour**
 - **850' queue**
 - **1-lane WB configuration appears feasible**

Central to Hanley – Existing Section



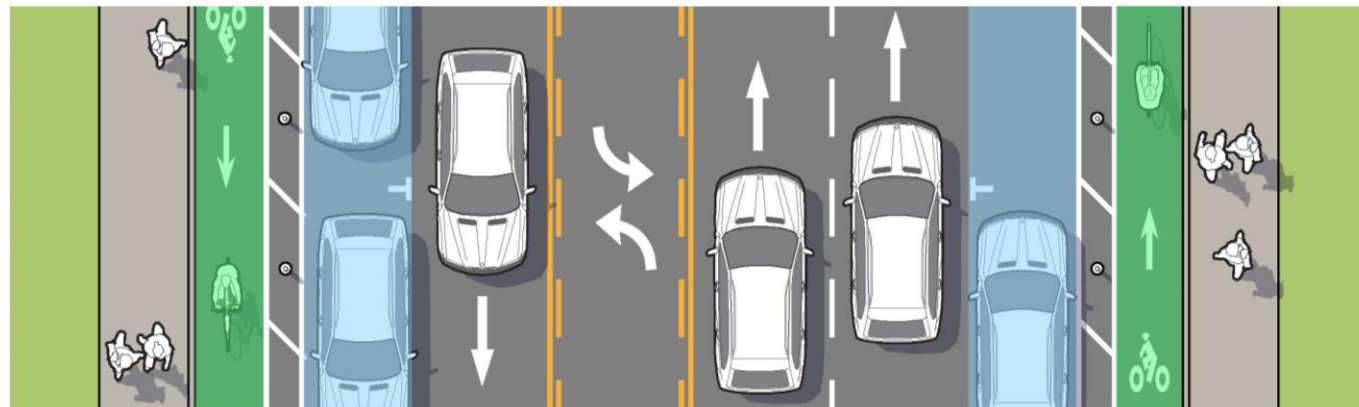
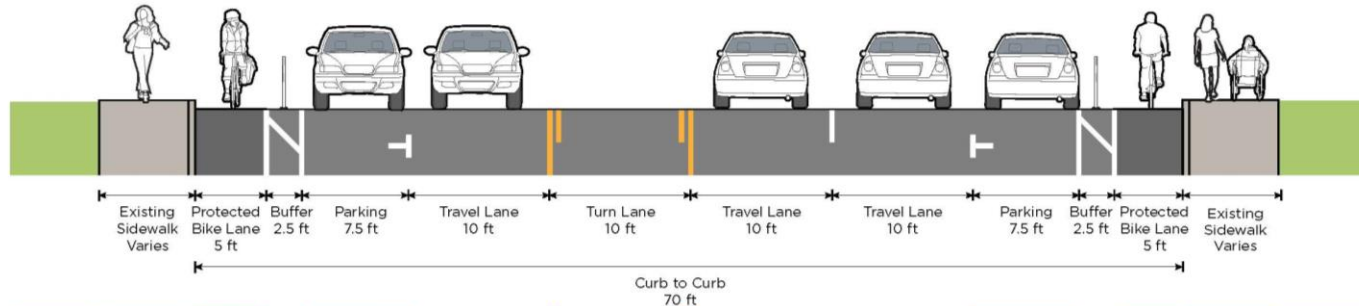
Looking East

Central to Hanley – Buffered Bike Lanes



Looking East

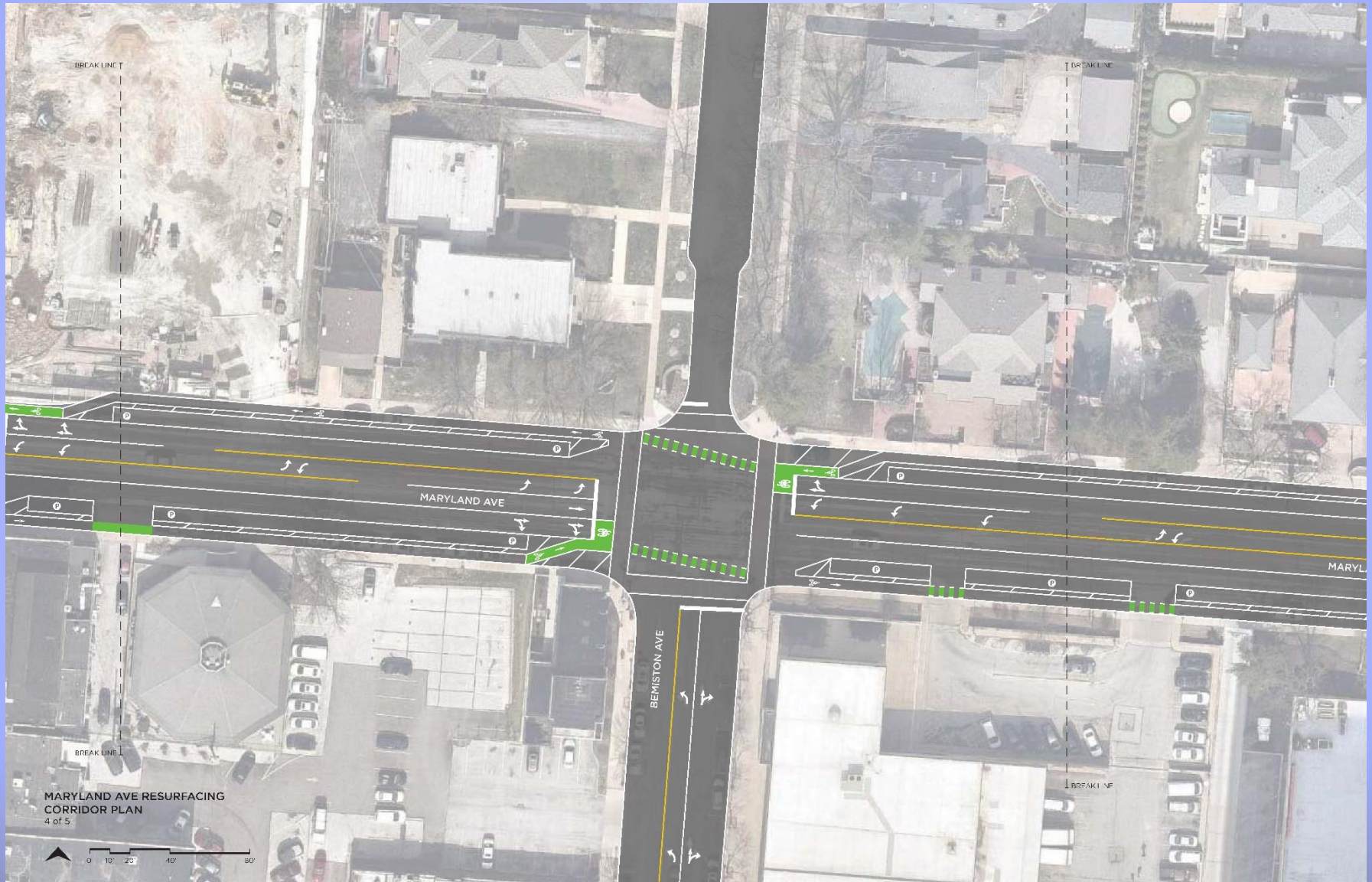
Central to Hanley – Protected Bike Lanes



Looking East

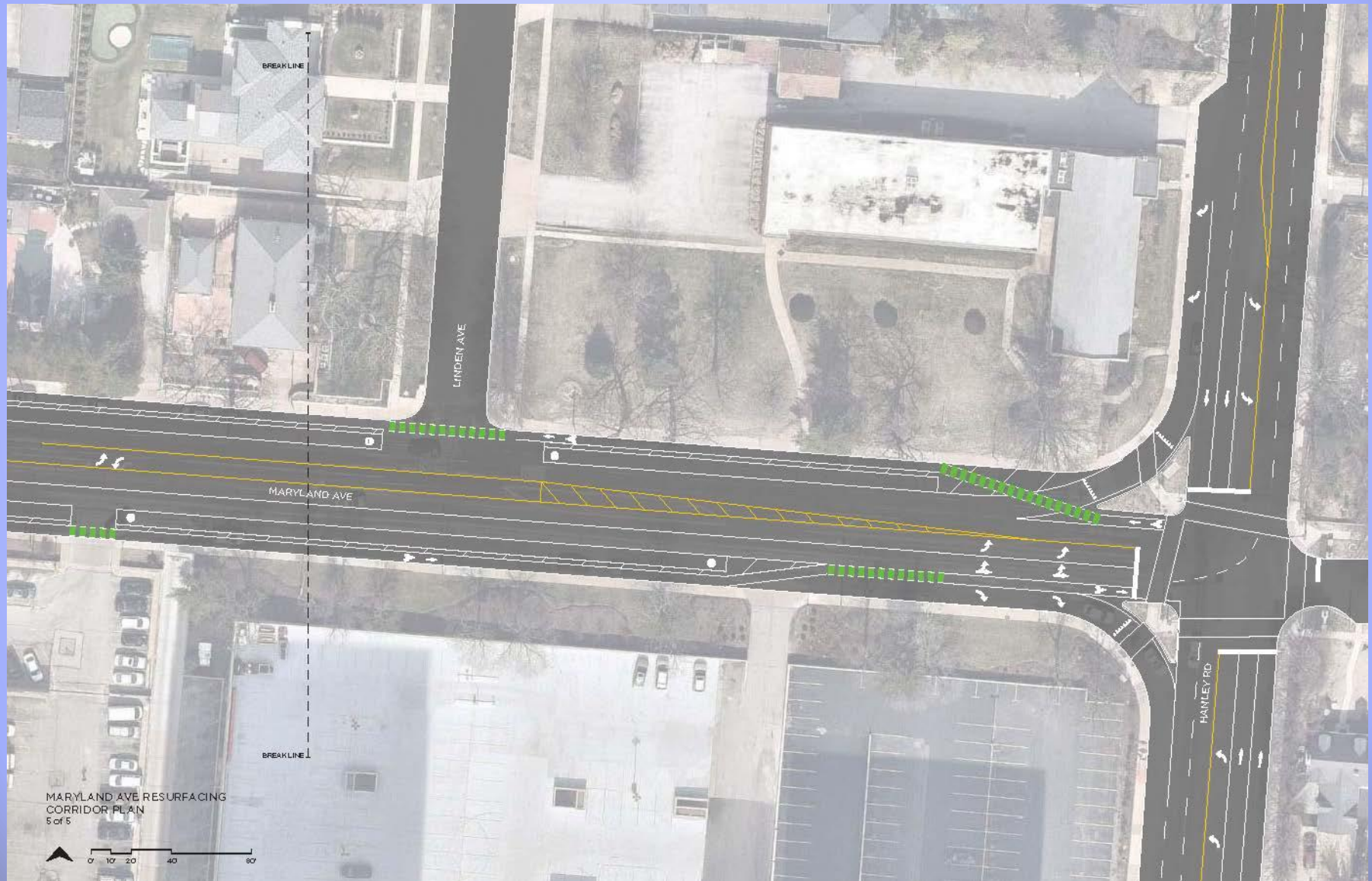
Maryland Avenue – Intersection Concepts

Bemiston Intersection (Protected Bike Lanes)



Maryland Avenue – Intersection Concepts

Hanley Intersection (Protected Bike Lanes)



Traffic Impacts

2 Lanes
EB & WB

2 Lanes EB &
1 Lane WB

Table 1: Traffic Operating Conditions – Existing and Proposed Option

Intersection/Approach	Existing Conditions		Proposed Option	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
<i>Maryland Avenue and Bemiston Avenue – Signalized</i>				
Eastbound Maryland Avenue	A (1.6) <25' TH	A (2.3) 35' TH	A (2.3) 40' TH	A (2.3) 35' TH
Westbound Maryland Avenue	A (1.8) 40' TH	A (8.4) 120' TH	A (2.9) 95' TH	B (10.7) 245' TH
Northbound Bemiston Avenue	B (18.9) 30' LT	D (37.3) 165' LT	B (18.9) 30' LT	D (48.7) 165' LT
Southbound Bemiston Avenue	B (17.3) 30' TH	C (20.9) <25' TH	B (17.3) 30' TH	C (21.0) <25' TH
Overall Intersection	A (3.3)	B (12.3)	A (4.1)	B (15.6)
<i>Maryland Avenue and Hanley Road – Signalized</i>				
Eastbound Maryland Avenue	D (38.8) 155' RT	C (27.6) 160' LT	D (33.8) 135' RT	C (26.2) 160' LT
Westbound Maryland Avenue	D (35.6) 35' TH	D (37.0) <25' TH	D (35.6) 35' TH	D (37.0) <25' TH
Northbound Hanley Road	C (24.9) 250' LT	D (44.2) 295' TH	C (24.9) 250' LT	D (44.2) 295' TH
Southbound Hanley Road	C (30.4) 260' TH	D (41.1) 235' TH	C (30.4) 260' TH	D (41.1) 235' TH
Overall Intersection	C (30.0)	D (38.5)	C (29.2)	D (38.1)

Traffic Impacts

Bike Lane – Queue Lengths – Bemiston Intersection



LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts

Bike Lane – Queue Lengths – Hanley Intersection



LEGEND

- EXISTING - A.M. PEAK (7:00-9:00 A.M.) TRAFFIC QUEUE LENGTHS
- EXISTING - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS
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- BIKE LANE - P.M. PEAK (4:00-6:00 P.M.) TRAFFIC QUEUE LENGTHS

Traffic Impacts Analysis

- **Impacts to WB PM traffic**
 - **500 vehicles per hour**
 - **No major change in queue lengths**
 - **1-lane WB configuration appears feasible**

Conceptual Cost Estimate

BICYCLE FACILITY OPTIONS - MARYLAND AVENUE	
MARYLAND ROAD SECTION	CONCEPTUAL COST ESTIMATE
Gay to Forsyth	
Bike Lanes (No Buffer)	\$25,000 to \$35,000
Shared Lanes	\$10,000 to \$15,000
Off-Route Bike Facility	
Option A (Includes intersection improvements)	\$70,000 to \$85,000
Option A (Pavement markings, signage and wayfinding only)	\$20,000 to \$30,000
Forsyth to Hanley	
Buffered Bike Lanes	\$80,000 to \$100,000
Protected Bike Lanes	\$160,000 to \$200,000

Next Steps & Schedule

- **Decision Regarding Design Options**
- **Complete Design (2018/2019)**
- **Property Easement Acquisition (2018/2019)**
- **Construction (2019/2020)**

MARYLAND AVENUE RESURFACING

**City of Clayton
Board of Aldermen
August 14, 2018**